Press release, 6 August 2020

Enhanced effectiveness and efficiency in vehicle handling | Successful tests at one of the world's largest car ports: "Isabella 2.0" is the follow-up to the Bremen-based "Isabella" research project | German government funding of EUR 2.5 million for Bremerhaven project

Artificial intelligence supports planning and control of car handling at ports

Bremen, Bremerhaven, Berlin. The services provided at car ports span virtually the entire spectrum of vehicle logistics, from handling and storage to technical services. With 2.1 million vehicles in 2019, Bremerhaven car terminal is one of the largest car ports in the world. The terminal's operations are highly complex and extremely dynamic, presenting major challenges with regard to process planning and control – the subject under investigation in the Isabella research project, which recently came to an end. The partners involved in the project – BIBA – Bremer Institut für Produktion und Logistik, BLG LOGISTICS and 28Apps Software – are now continuing their successful collaboration with Isabella 2.0.

Additional government funding for research into new port technologies in Bremen

The three-year R&D project Isabella (full name: "Automobile logistics in sea and inland ports: interactive and simulation-based operation planning, dynamic and context-based control of device and load movements"), which was completed at the end of June, had a total project volume of EUR 3.7 million. It received funding amounting to EUR 2.6 million from the German Federal Ministry of Transport and Digital Infrastructure (BMVI) as part of the IHATEC funding programme for innovative port technologies and was supervised by project sponsor TÜV Rheinland.

Follow-up project Isabella 2.0 has the title "Automobile logistics in sea and inland ports: integrated and user-oriented control of device and load movements through artificial intelligence and a virtual training application". It will also run for three years and will again be supervised by TÜV Rheinland. It has a total volume of around EUR 3.6 million and will receive a further EUR 2.5 million from the BMVI's IHATEC programme.

Isabella system enables rapid adjustment in line with current conditions

The Isabella project resulted in the development of an intelligent planning and control system for logistics processes and vehicle movements at sea and inland ports, which was tested in prototype form at the BLG car terminal in Bremerhaven. Planning is supported by an interactive, digital interface: a multitouch table visualises the terminal site in three dimensions. All of the relevant planning information, such as the utilization of the terminal, can be displayed at various levels of detail. The system makes it possible to analyse different planning scenarios using simulations and to present the results on the multitouch table.

With the aid of mobile data acquisition and real-time status reports, a control algorithm allows movement jobs to be allocated individually, thus optimising the travel paths and enabling a rapid response to changing conditions. The process of allocating jobs has been digitised. Movement jobs for vehicles at the terminal are assigned according to the location of the vehicles and drivers. The control algorithm was developed to manage this process and initial testing was carried out within a simulation environment which maps the terminal's operations digitally. In the real-life system, communication between the control system and the car terminal personnel takes place via mobile apps. A new locating system was developed to determine the location of the vehicles.

The next step:
expanding the system to cover all handling processes by incorporating external modes of transport

The Isabella project focused on the processes at the terminal and on internal car movements. The aim of Isabella 2.0 is to integrate external modes of transport – trains, ships and lorries – with their loading and unloading processes and to systematically expand the control system and the simulation environment to cover all handling processes. For this to happen, it is necessary that data can be received within the different modes of transport. The project partners' intention is to use the new 5G mobile communications standard or to set up a local communication network for this purpose. Options such as ad hoc and mesh networks in combination with wireless standards such as Wi-Fi, Bluetooth or LoRa (Long Range Wide Area Network) are being considered for the latter.

The logistical capabilities of the system are to be further improved using sensitivity analysis and artificial intelligence (AI) methods. The Taguchi method is to be used alongside critical neural networks (CNN) and support vector machines to enable situation-specific parametrisation of the optimisation algorithm. This means that, in the future, more criteria relating to the current situation will be incorporated into the optimisation process, including the terminal utilization rate, mix of vehicles and staff capacities.

The performance of the control algorithm is to be examined by means of simulations, new data analysis methods and AI, taking into account the specified criteria and parameter settings. Data obtained during operation will be used to systematically determine relevant process KPIs such as travel path utilisation or the time required for individual process steps, enabling better planning and, hence, more efficient operational movement processes.

Key factor: workers in the field

Innovation projects work best when particular attention is given to the interface with the users right from the outset. As a result, from the beginning of the Isabella R&D work, there was a strong focus on the user-friendliness of the planning and control system and on integrating personnel into the development phase.

For the project partners, this is central to the success of the project: "To ensure greater acceptance of the new technology, employees need to be involved in the development processes, as some of the innovations mean major changes to the way they work." The partners are therefore drawing on principles from the field of industrial and organisational psychology in order to involve the terminal staff in the design process for the new system. The Isabella 2.0 project will include the development of a virtual training application based on the multitouch table. Furthermore, the introduction of the new applications is to be supported by virtual reality (VR); for example, with the use of VR glasses.

Combination of research, development and application

BIBA – the research partner in the Isabella 2.0 project – has extensive expertise when it comes to planning, controlling and simulating logistical processes and will be responsible for improving the optimisation algorithm using artificial intelligence and data analysis methods. BLG LOGISTICS is the application partner and overall project manager. The company ensures that the research is practice-oriented: initial testing of the Isabella system was carried out at Bremerhaven car terminal and any subsequent developments can also be trialled by the partners at the site.

Technology and development partner 28Apps Software developed the software solutions for the multitouch table and the apps. In the Isabella 2.0 project, the company will be responsible for the implementation of the virtual training application, the development of a control cockpit and – together with BIBA – the development and implementation of artificial intelligence.

(Sabine Nollmann)

Note to editors:

Photos relating to the press release can be found at
www.biba.uni-bremen.de/presse/pressemitteilungen/2020/pressemitteilung-vom-6-august-2020.html
or obtained from Sabine Nollmann (e-mail: mail@kontexta.de, mobile: +49 170 904 11 67)

Further information:

https://projekt-isabella.de and www.isabella2.de (website still under construction)
www.biba.uni-bremen.de, www.blg-logistics.com, www.28apps.de

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